Nepenthes Corrections to **WORLD CARNIVOROUS PLANT LIST CPN 15(3-4)**

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N. Accentual Koto Hort. ex Kawase = thorelii X hookeriana (1974)
N. Ambrosial Koto Hort. ex Kawase = trichocarpa X hookeriana (1974)
N. Balmy Koto Hort. ex Kawase = thorelii X maxima (1975)
N. Effulgent Koto Hort. ex Kawase = mirabilis X thorelii (1978)
N. Hachijo Okuyama = lecouflei X mirabilis (1979)
N. Ille de France, Y. Vezier (France) = lecouflei X mixta (1981)
N. Ville de Rouen, Y. Vezier (France) = Superba X Mastersiana (1981)

Evolution in Lentibulariaceae: A Criticism of Snyder

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We are told by Ivan Snyder in a recent number of this journal (C.P.N. *16*(1):17-19) that 'Carnivorous plant evolution has been a mystery for a long time.' His account, which purports to 'hypothesize the most logical evolutionary scheme' for the Lentibulariaceae, does little to clarify the mystery; worse, it is grossly misleading, is at variance with the facts and will only serve to confuse a great many people.

His suggestion that *Pinguicula* is the most 'primitive' genus of the family is a widely held one. But the steps he suggests for the evolution of *Pinguicula* into *Utricularia* (briefly summarized as follows) are incredible:

Firstly, we are told, air floats develop in the roots of the butterwort. These were 'very advantageous and kept the plant buoyant when washed into water, where it could grow on the surface where there was less competition.'

Secondly, glandular hairs and enzyme glands were relocated from the leaves to the inner surface of these root float bladders, animals finding their way into them and becoming digested.

Thirdly, 'this new trapping device developed a good passageway into itself and proved to be very efficient.' The butterwort leaves become a burden and are reduced, lose their glue. Some of these become *Genlisea,* others evolve onwards to become *Utricularia:* their traps form oneway doors.

Fourthly, 'the bladders (gain) the ability to alter turgor pressure in some of its cells when touched. Cellular turgor is controlled in the plants phototrophic response to make possible the ability to turn toward light. When this became relocated to the walls of the bladders, the bladders could warp and produce a vacuum in the trap.'

Presto! We have *Utricularia!* Or do we?

Amongst the 'facts' upon which 'the most logical evolutionary scheme' is supported are that 'aquatic' bladderworts use their bladders not only for trapping, but also in flotation. This idea is patently not true and was disproved in the last century (Darwin, 1875). Its veracity is simply tested by cutting the traps off a plant: the plant still floats! The basis of this false flotation function of traps seems to be Snyder's view that they are full of air, since they are supposedly developed from airspace derived root-floats. In fact, *Utricularia* bladders only operate when full, or very nearly full, of water. Air occurs largely as an artefact, introduced when plants are taken out of their aquatic environment (Lloyd, 1942).

Further, we are confronted with the root float origins of the *Utricularia* trap. Surely, everyone knows that *Utricularia*, like *Aldrovanda*, has *no* roots! Even the most basic textbooks of botany (Metcalfe and Chalk, 1961) admit that from the seed onwards, no root is ever differentiated in *Utricularia.* This is the most fundamental of errors conceivable in homology. Whether or not a *Pinguicula* ever developed root floats (it seems most unlikely that they were so 'very advantageous', for if they were, surely some of the present day ones would possess them!) and supposing for a moment that in some ancient *Pinguicula* these root floats did develop into animal traps, it is certain that such were *not* the ancestors of *Utricularia* where the traps are stem-leaf derived.

Next, we must deal with Snyder's monumental fallacy concerning the operation of the *Utricularia* trap. Leaving aside his antedeluvian beliefs in air-filled, floating, root-derived traps, we must now face his view that "Mutations ... gave the bladders the ability to alter turgor pressure in some of its cells when touched. Cellular turgor is controlled in the plants phototrophic response to make possible the ability to bend toward the light. When this became relocated to the walls of the bladders, the bladders could warp and produce a vacuum [negative pressure] in the trap." This is simply not true (cf. Fineran, 1985; Lloyd, 1942). The negative pressure in the trap is caused by the internal glands pumping water to the outside, *not* by the walls warping. The walls do indeed warp, but this is effect, rather than cause. The negative pressure developed in the trap, responsible for the ability to 'suck animals through the door' has nothing to do with phototrophic responses in the form of turgor pressure in the bladder walls.

If, indeed *Pinguicula* is the ancestor of *Utricularia,* it is far more likely that the traps are evolved from the leaves. True, it is still extremely difficult to imagine, let alone reconstruct, how this, the most sophisticated animal trapping device in the plant world (Lloyd, 1942), evolved, or why it has developed in such bewildering diversity (see Taylor, 1964). No need the to invoke relocation of leaf hairs and glands to the roots, or the fantastical fairy tale of air-filled root bladders and floating Butterworts.

Ivan Snyder is to be commended on his well written article. But one should be aware that it is largely science fiction, not fact.

References:

Darwin (1875), *Insectivorous Plants:* 404 London.

Fineran (1985), Isr. J. Bot. *34:*295

Lloyd (1942), *The Carnivorous Plants* Chronica Botanica

Metcalfe and Chalk (1950), *Anatomy of the dicotyledons 2:*993

Snyder (1987), C.P.N. *16*(1):17-19

Taylor (1964), Kew Bulletin *18*(1):1-245

Corrections continued from page 101

U. roseopurpurea *STAPF EX GAMBLE* = caerulea *L.*
U. sampathii SUBRAMANYAM & YOGANARASIMHAN INDIA = caerulea *L.* ?
U. schinzii *KAM.* = bisquamata *SCHRANK*
U. welwitschii *OLIV.* var. odontosepala *(STAPF) P. TAYLOR* = odontosepala *STAPF*